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WITNESS my hand this
Twenty-second day of July 2003

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Regulation 3.2

Quantum Workhealth Programmes Pty Ltd

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

"Glass handling systems"

The invention is described in the following statement:

GLASS HANDLING SYSTEMS

The present invention relates to systems for handling sheets of glass or other sheets of relatively rigid and relatively smooth material such as metal, marble, or plasterboard.

To manually manoeuvre relatively large sheets of glass or metal a grip device may be temporarily applied to the surface of the sheet to provide a hand grip or hand hold by which the sheet can be held. US patent 3,240,525 discloses a vacuum grip having a handle and a gripping pad which can be attached to the surface of the sheet by a small hand-operated vacuum pump whereby the grip can be securely attached to the surface of the sheet by a vacuum effect without damaging the surface of the sheet. Vacuum grips of the type shown in US 3,240,525 have been commercially available for many years and are in common use to facilitate manual transportation and manoeuvring of relatively large sheets of glass and the like in factories, in workshops, and by trades people such as glaziers and shop fitters. Typically, for use with larger sheets of glass, two or perhaps more, of the vacuum grips are applied to the surface of the sheet to enable the sheet to be manoeuvred and transported by two or more people, and when the sheet is in the required position the grips are removed from the sheet simply by releasing the vacuum.

Although grips such as those just described are a significant aid to handling large sheets of glass and the like, nevertheless due to the weight of the glass sheet and sometimes the physical size of the sheet, strain injuries can often arise to personnel. A particular problem can also arise when manipulating a large sheet of glass for accurate placement into a frame such as may be incorporated in a shop front or similar.

According to the present invention, there is provided a device for handling glass or other sheet material, said device being in the form of a wheeled trolley and having at least one vacuum grip for releasable attachment to the surface of the sheet to thereby support the sheet from the trolley, said trolley having at least one ground engaging wheel, and means enabling the height of the vacuum grip relative to the wheel to be adjusted.

In one preferred form, the vacuum grip comprises a vacuum gripping pad associated with a vacuum pump which can be operated to apply a vacuum.

In preferred embodiments of the invention, the trolley comprises a main support shaft which extends upright in use of the trolley and the vacuum grip is mounted for movement into a selected position along the length of the shaft with means to secure the grip in a selected position.

In one embodiment, the shaft is threaded and the vacuum grip includes threaded structure for engagement with the thread of the shaft. Preferably the threaded structure is in the form of a split nut which can be released from engagement with the shaft thread to thereby enable the vacuum grip to be displaced along the shaft to a selected position at which the split nut is re-engaged.

Particularly advantageously the device also includes means for rotating the shaft whereby when the threaded structure is engaged with the shaft and the vacuum grip is coupled to the sheet, rotation of the shaft will raise or lower the sheet relative to the ground to thereby permit relatively fine adjustment in the height of the sheet to facilitate placement.

In another embodiment, the grip is secured in a selected position by a pin inserted through the body of the grip to engage in a selected one of a series of holes spaced lengthwise in the shaft.

Particularly advantageously, the shaft carries two or more such vacuum grips for engagement with the sheet.

A system for handling relatively large sheets will involve the use of at least two trolleys as defined above. For this purpose it is particularly convenient for each trolley to have a single ground-engaging wheel at the lower end of the main supporting shaft and mounted with a caster action.

In alternative forms the trolley may have wheels mounted in tandem fashion so that use of a single trolley on smaller sheets will itself provide stable support.

The trolley may include a gas spring which supports the shaft from the wheel or wheels to permit controlled lowering of the sheet carried by the trolley.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic view showing a sheet handling system involving the use of two wheeled trolleys in accordance with a preferred embodiment of the invention;

Figure 2 shows schematically a detail "A" of the trolleys of Figure 1 to show a vacuum grip and its relationship with a main support shaft;

Figure 3 is an exploded view corresponding to Figure 2;

Figure 4 is a front view corresponding to Figure 2;

Figure 5 is a side view corresponding to Figure 2;

Figure 6 is a schematic sectional view to illustrate internal structure of the body of the vacuum grip;

Figure 7 is a fragmentary view showing an actuating handle and associated structure of a ratchet system for rotating the main support shaft;

Figure 8 is an exploded view corresponding to Figure 7; and

Figure 9 is a perspective view showing an alternative embodiment of the invention.

Figure 1 of the drawings shows a glass handling system in accordance with the preferred embodiment of the invention. The handling system comprises two wheeled trolleys 2 to which a sheet 4 of glass is attached so that the sheet can easily be transported and manoeuvred. Effectively therefore the sheet 4 can be wheeled along the ground without causing undue strain to the personnel concerned. Each of the trolleys 2 is identical and the construction of the trolley will now be described.

The trolley 2 consists of a single support shaft 6 which is upright during use. The lower

end of the shaft 6 carries a single wheel 8 which is preferably supported from the shaft with a caster action. Although it would be possible for the trolley 2 to have more than one wheel at the lower end of the support shaft 6, for example two wheels arranged side by side or in tandem, in the embodiment illustrated in which the trolley 2 is principally intended to be used in conjunction with other identical trolleys in the manner shown in Figure 1, a single wheel with a caster action is preferred as this permits particular ease of manoeuvrability. The support shaft 6 carries two vacuum grips 10 at upper and lower positions along its length to permit secure, but releasable, attachment to the sheet 4. It is to be noted that although the embodiment illustrated has the two vacuum grips 10, the invention is not restricted to the use of two grips; depending on particular requirements, the trolley may be designed with only a single vacuum grip or more than two vacuum grips. The basic construction and operation of the vacuum grip 10 including a vacuum pump 12 with a vacuum release facility is preferably as disclosed in US patent 3,240,525 to which reference may be made particularly for an understanding of preferred aspects of the design of a gripping pad 14 and associated structure. The vacuum grip 10 used in the preferred embodiment of the invention differs from that shown in the US patent principally in the design of its main body by which it is attached to the support shaft 6 and that will now be described in detail.

As shown, the main body 15 of the grip 10 and to which the vacuum gripping pad 14 and associated structure is attached is of block-like form having a vertical passage 16 through which the shaft 6 extends. The shaft 6 is externally threaded and the body 15 houses a split nut 18 which is normally engaged with the thread of the shaft. It is to be noted that the shaft 6 is threaded over substantially its entire length, although in these drawings which are only schematic drawings the thread is for clarity of illustration only indicated on part of the shaft. The body 15 carries a spring-loaded release system which operates under spring bias to maintain the two halves 18a, 18b of the split nut 18 in engagement with the thread of the shaft 6. The release system is manually actuable to move the two halves of the nut 18 apart out of engagement with the thread, and in this disengaged position the vacuum grip 10 is able to be quickly displaced along the shaft into a selected position for use, whereon the vacuum grip 10 can be retained in that position by re-engagement of the two halves of

the split nut 18 with the thread.

The release system comprises a release lever 20 mounted for pivotal movement on a pivot pin 22 extending parallel to the shaft 6. A first horizontal pin 24 extends at one side of the pivot pin 22 to the adjacent, inner, half nut 18b for threaded engagement therewith. A second horizontal pin 26 at the other side of the pivot pin 22 extends through a passage in the adjacent half nut 18b into threaded engagement with the other, outer, half nut 18a; this is best seen in Figure 6. The outer half nut 18a is subject to the action of a compression spring 30 which displaces that half nut in an inwards direction for engagement with the thread. An outer end of the release lever 20 is also subject to the action of a compression spring 32 which applies a pivotal bias to the lever 20 in a sense to bias the lever anticlockwise (as viewed in Figure 6) about pivot pin 22 whereby the inner half nut 18b is pushed by the pin 24 inwardly into engagement with the thread and the outer half nut 18a is drawn inwardly, this action reinforcing the action of the spring 30. In this way the two half nuts 18a, 18b are held firmly, but releasably, in engagement with the thread. In order to release the half nuts 18a, 18b from engagement with the thread and thereby to permit adjustment of the position of the vacuum grip 10 along the shaft 6, the release lever 20 is displaced clockwise (as viewed in Figure 6) against the bias of the spring 32. In the embodiment shown, this actuation of the release lever 20 to release the half nuts 18a, 18b is effected by depressing a button 34 incorporated in a side wall of the main body 15.

The main body 15 also includes an outer handle 36 by which the vacuum grip 10 can be held for displacement along the shaft 6. Conveniently, the release button 34 is aligned with the axis of the handle 36 and is at one end thereof so that the handle 36 may be gripped with one hand with the thumb of that hand depressing the release button 34 to permit the movement of the vacuum grip 10 along the shaft 6.

Although the release mechanism just described is particularly convenient, it will be understood that other mechanisms which effect temporary release of the half nuts from the thread can alternatively be used.

The system just describes a quick-action coarse adjustment of the position of the vacuum grip 10 along the shaft 6 to suit a particular application and, for many applications, this type of adjustment will be adequate so that the trolley can readily be adjusted to suit the size of glass sheet being handled and also the height at which the glass sheet is held above the ground. However, for applications such as shop fitting when it is necessary for the grass sheet to be manoeuvred into substantially precise alignment with a frame for fitting into the frame, a further, fine, adjustment system is provided. In the embodiment shown, this fine adjustment is provided by rotating the shaft 6 while the vacuum grips 10 are attached to the sheet with their split nuts 18 engaged with the thread of the shaft 6 whereby rotation of the shaft 6 in a selected direction will cause the vacuum grips 10 associated with the shaft 6 and hence the sheet carried thereby, to move upwardly or downwardly. In the embodiment shown where two trolleys 2 are used to carry the sheet of glass it will be appreciated that by selective rotation of each of the two shafts 6 the sheet of glass can be accurately positioned at a height such that it can be "pushed" on the trolleys 2 into the support frame in exact alignment with the opening of the frame. Although the degree of adjustment which can be achieved in this way is dependent of the thread pitch, even with a relatively coarse thread a relatively fine vertical adjustment can be achieved to provide accurate placement of the glass sheet.

Rotation of the shaft 6 to effect this fine adjustment can be effected in any suitable way, for example using a handle linked to the shaft via a suitable gear system. In the particular embodiment shown, the shaft 6 is formed with a pinion gear 40 driven by reciprocating movement of a handle 42 via a reversible pawl 44 so that by appropriate setting of the pawl 44 the pinion gear 40 is driven by a ratchet action in a selected direction by operation of the handle 42, and thus the shaft 6 can be driven in a direction either to raise or lower the position of the vacuum grips 10, as required. A lever for setting the driving direction of the pawl 44 is shown at 46. It will be seen that the ratchet handle 42 projects substantially horizontally to facilitate easy access. In alternative arrangements, the shaft 6 can be rotated via a bevel-gear system using a handle located at the front of the trolley (ie the side remote from the glass) with the handle being rotatable in either direction in order to raise and lower the vacuum grips 10.

Although a fine adjustment system provided by rotation of the shaft is particularly preferred, nevertheless for some applications where fine adjustment in the positioning of the sheet carried by the trolley is not required, this facility could be omitted.

In a somewhat simplified embodiment as shown in Figure 9, the vacuum grips 10 are slidable along the shaft 6 and each vacuum grip is securable in a selected position along the shaft 6 by insertion of a pin through an aperture in the body 15 of the vacuum grip to engage in a selected one of a series of vertically spaced holes formed in the upper and lower parts of the shaft 6. It will be appreciated that the adjustment in this embodiment will thereby be in discrete steps along the shaft and although it does not permit the fine degree of height adjustment enabled by the first embodiment, nevertheless for some applications this relatively coarse stepwise adjustment will be quite sufficient particularly in situations where the trolley is not used to accurately position the sheet carried by the trolley. In this somewhat simplified form, the omission of the coarse and fine adjustment system of the first embodiment provided by the thread and split nut system should result in some cost reduction. In this embodiment, the shaft is preferably bent between the zones of movement between the upper and lower vacuum grips 10 in order to form a handle 6a for the trolley.

In modification of each of the embodiments disclosed herein, the lower end of the shaft is connected to the wheel 8 via a gas spring or similar which can be actuated to permit controlled lowering of the shaft and sheet carried thereby to the ground under the weight of the sheet. When the sheet has been released from the vacuum grips, the gas spring can then be actuated to return the shaft to a selected raised position under the force of the spring.

The trolley 2 of the preferred embodiment is specifically designed for use with at least one other trolley to jointly carry a sheet in the manner illustrated in Figure 1 and trolleys of this form are suitable for use with a wide range of sizes of sheet. A trolley having applicability just to smaller sizes of sheet can be of similar construction to that just described but with

the lower end of the shaft 6 coupled to a chassis or beam carrying two or more wheels in tandem relation to provide a stable support for the sheet when the trolley is positioned approximately midway along the length of the sheet. Depending on the size of the trolley it may be necessary to incorporate bracing between the shaft and chassis/beam to ensure the structural integrity of the trolley.

Although the invention has been particularly described in relation to the handling of glass sheets, it is to be understood that the trolleys as described are equally applicable to handling other relatively heavy rigid sheet material such as metal sheet, marble, or plasterboard.

The embodiments have been described by way of example only and modifications are possible within the scope of the invention.

DATED this 20th day of November 2002

Quantum Workhealth Programmes Pty Ltd

By DAVIES COLLISON CAVE

Patent Attorneys for the applicant

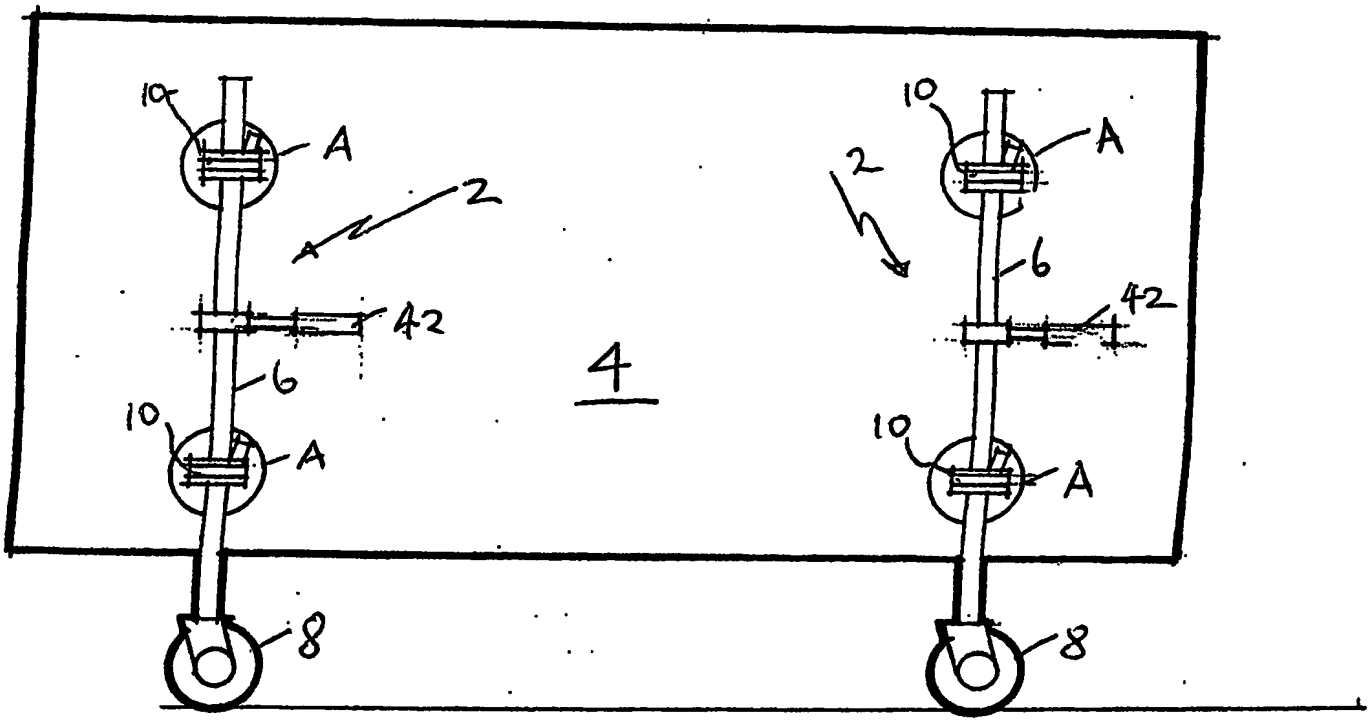

FIGURE 1

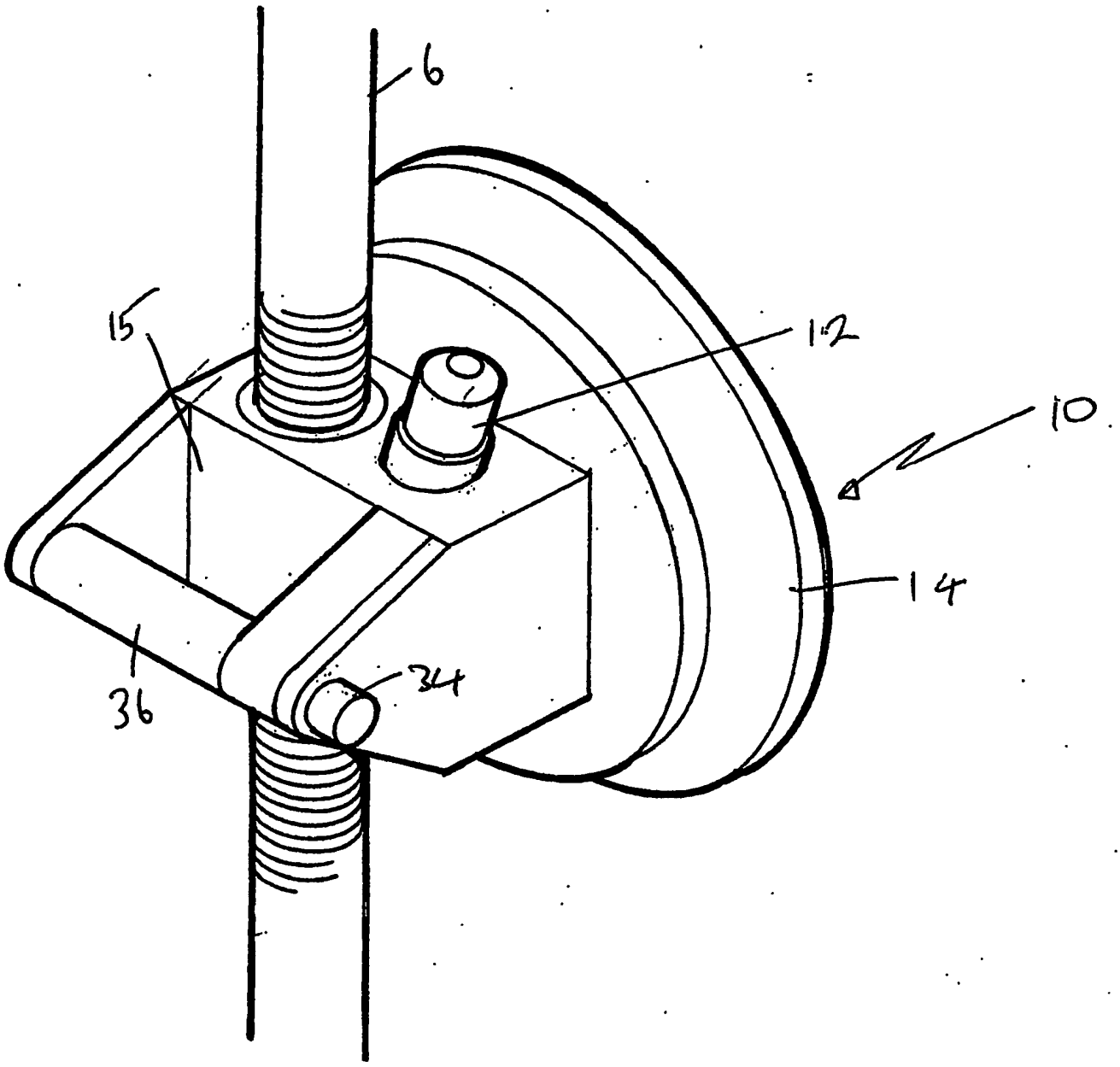

FIGURE 2

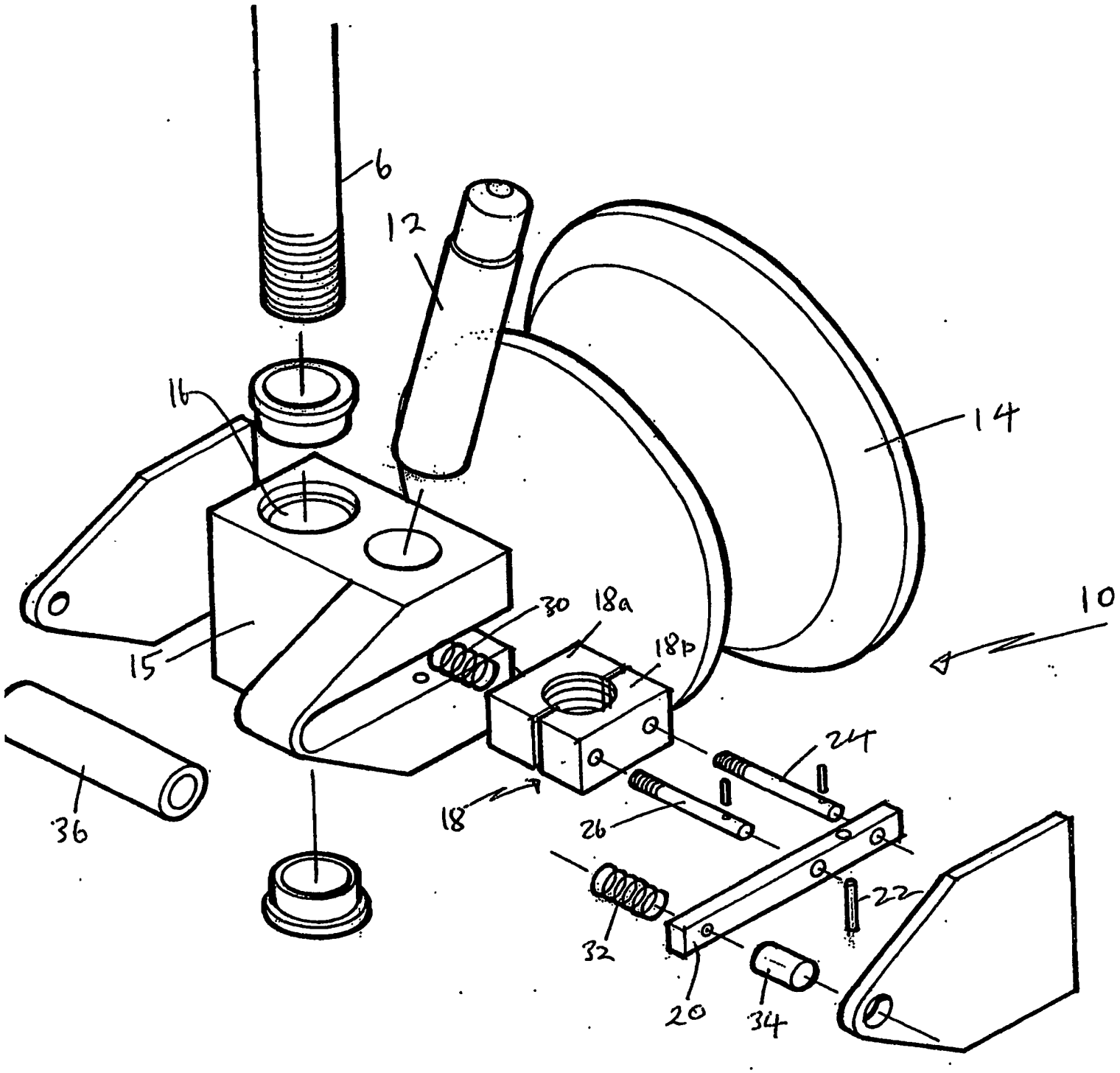

FIGURE 3

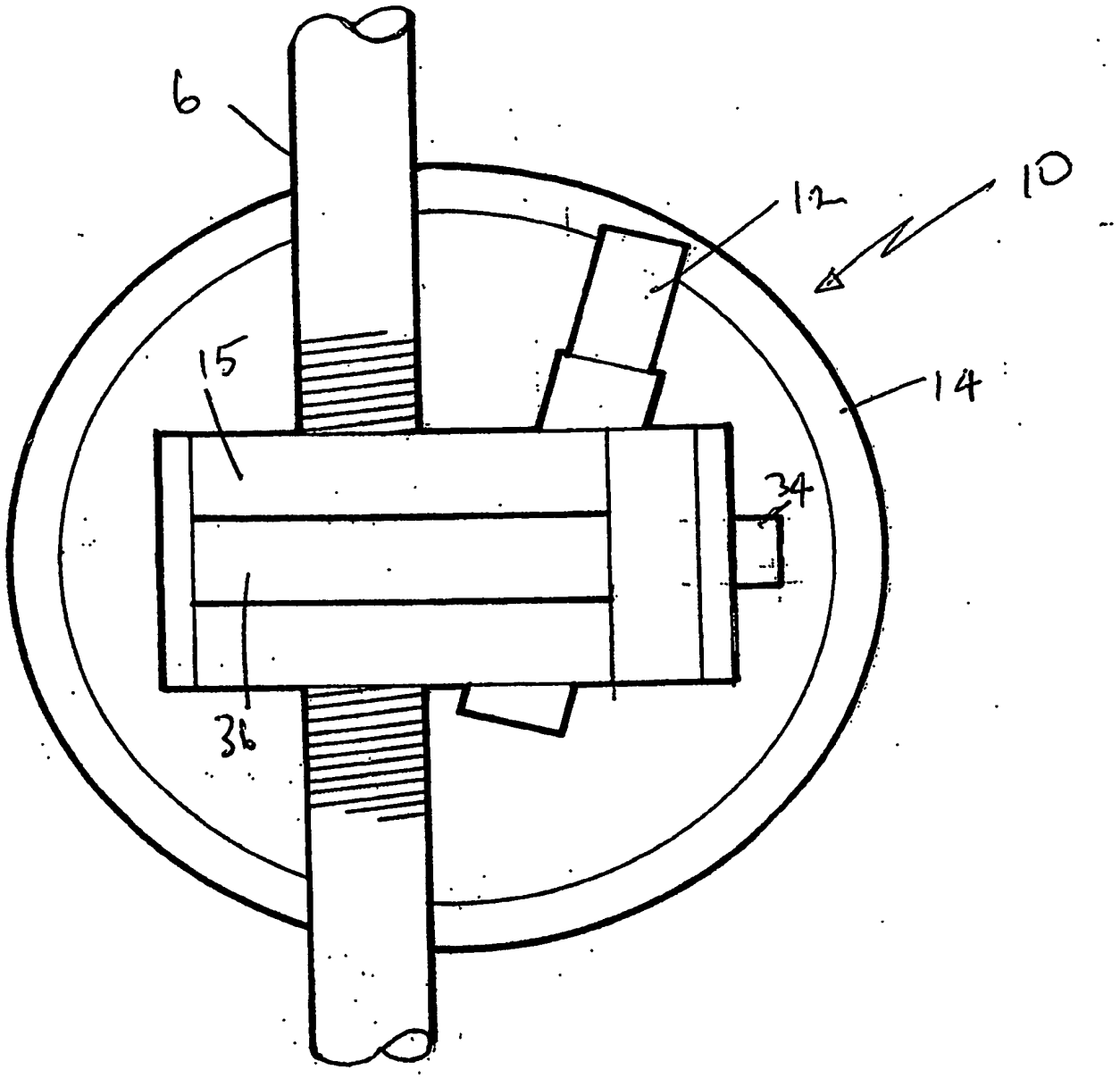

FIGURE 4

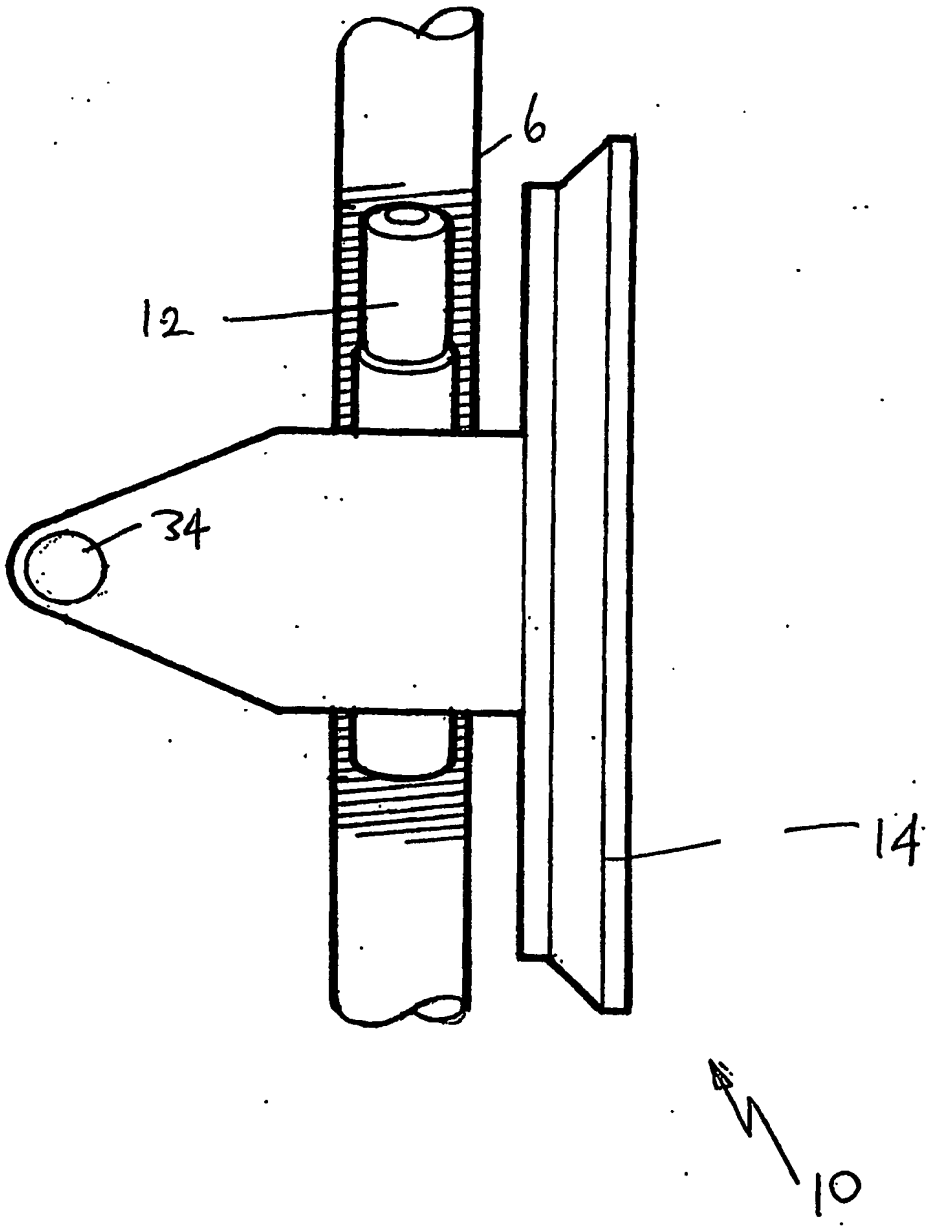

FIGURE 5

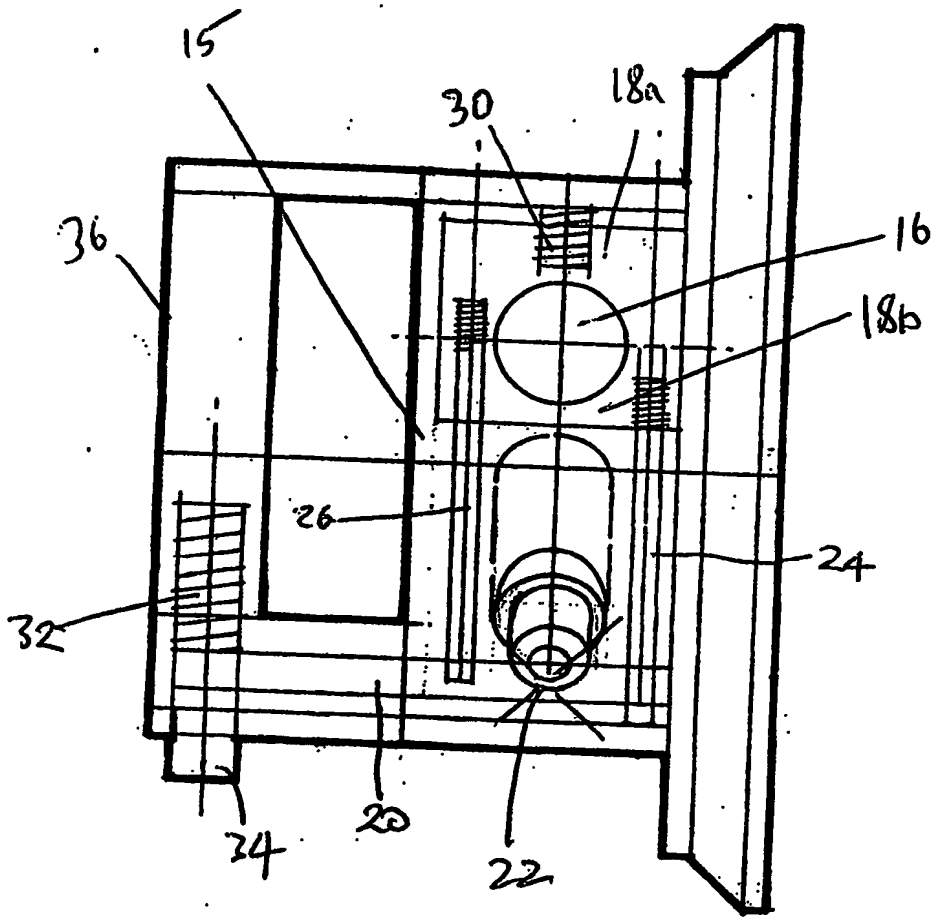

FIGURE 6

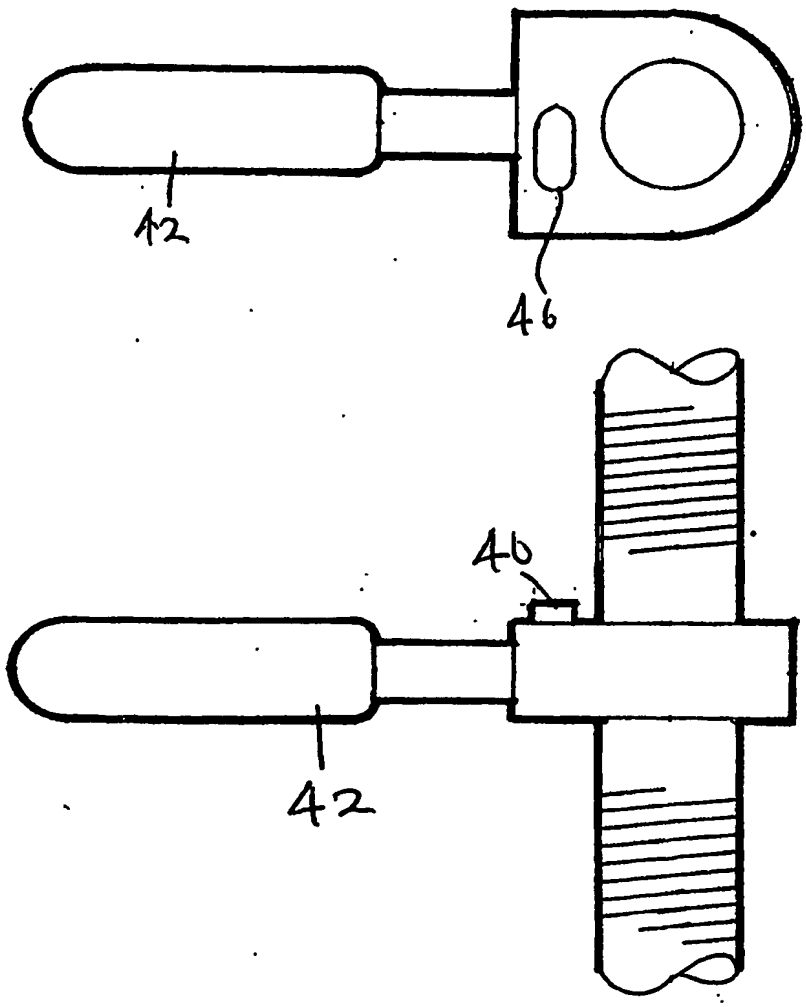

FIGURE 7

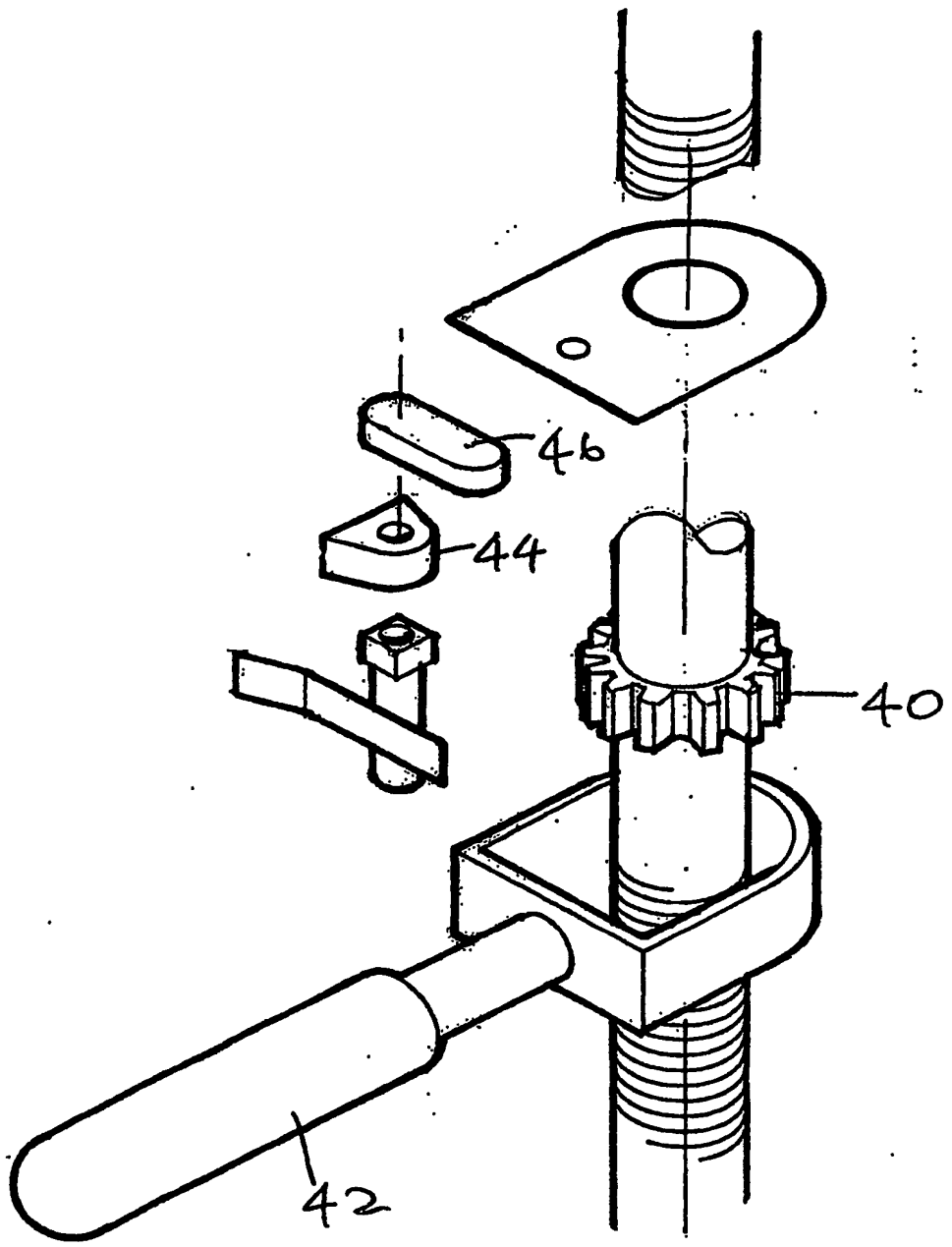

FIGURE 8

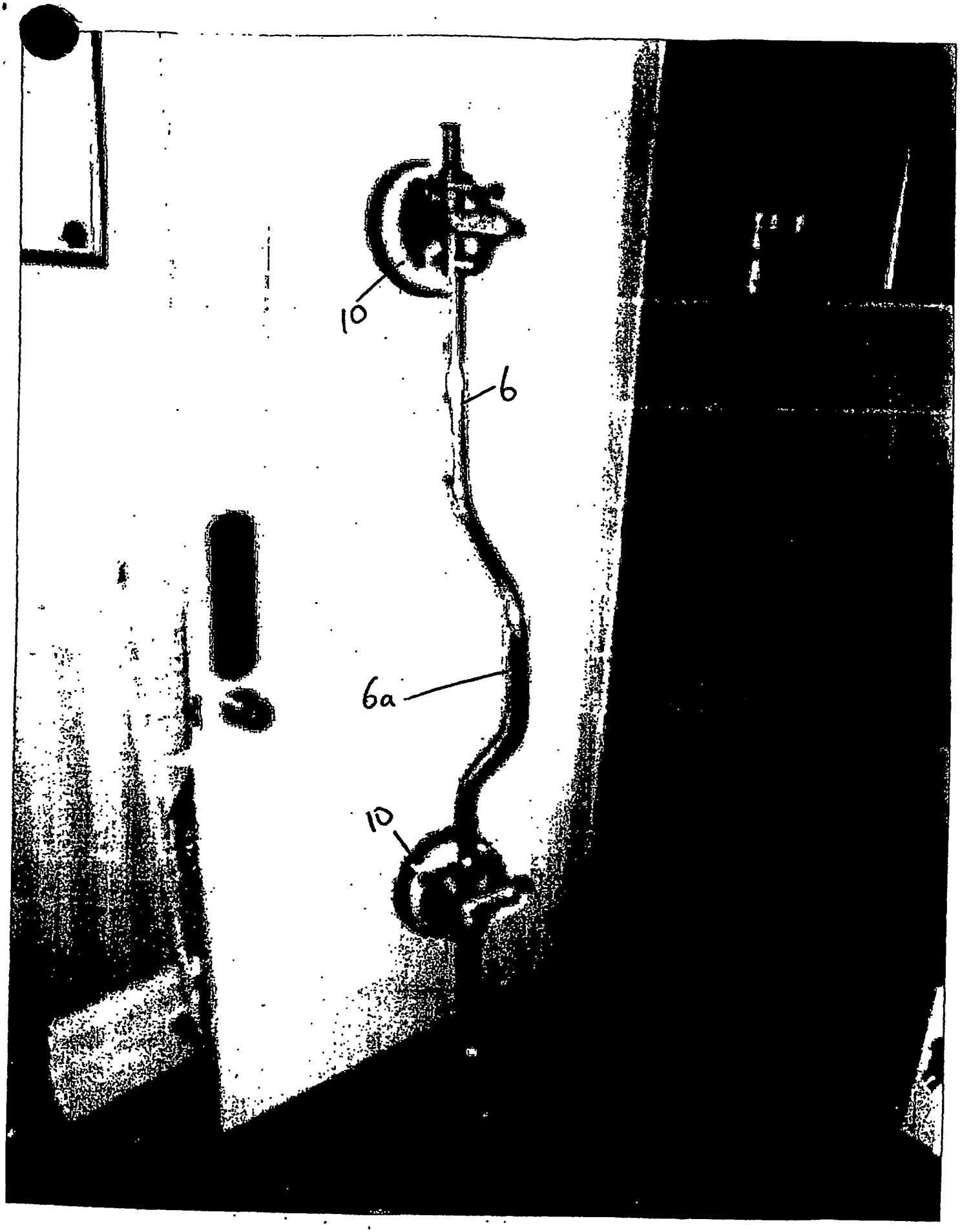

FIGURE 9

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